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ice; and the studies made by him and others upon the temperature and moisture of the air on the inland ice corroborate this conclusion. His expedition started in May. A Danish expedition will also be sent to the east coast of Greenland.—The death of Dr. Kayser, who had been sent by the German African Society to their station on the shores of Lake Tanganyika, is announced in a communication from Zanzibar, dated Nov. 8, 1882.—The Lena meteorological station is situated in  $73^{\circ} 22' 30''$  N. lat., and  $126^{\circ} 34' 55''$  E. long. The health of the expedition is satisfactory.

#### GEOLOGY AND PALÆONTOLOGY.

THE DECAY OF ROCKS GEOLOGICALLY CONSIDERED.<sup>1</sup> — The author in this paper presented, in a connected form, the principal facts in the history of the decay both of crystalline silicated rocks and of limestone or carbonated rocks by atmospheric agencies. Having first discussed the chemistry of the process, he noticed the production of spheroidol masses or so-called boulders of decomposition by the decay and exfoliation of massive rocks. He then proceeded to show that the process of decay is not, as some have supposed, a rapid or a local one, dependent on modern conditions of climate, but that, on the contrary, it is universal and of great antiquity, going back into very early geological periods. These conclusions were supported by details of many observations among Palæozoic stratified and eruptive rocks in the St. Lawrence valley, as well as among Eozoic rocks in the Atlantic belt, as seen in Hoosac mountain, in the South mountain and in the Blue Ridge. In connection with the latter he described the decay not only of the crystalline strata but of their enclosed masses of pyritous ores and the attendant phenomena.

The decay of the primal and auroral strata of the Appalachian valley, and the formation therein of clays and of iron and manganese-oxyds was also discussed. The Pre-cambrian antiquity of the process of decay in the Eozoic rocks in the Mississippi valley, as shown by Pumpelly and by Irving, was noted, as well as similar evidence from Europe; while the more recent decomposition seen in the Pliocene auriferous gravels in California was described and explained.

The final removal of the covering of decayed rock from many northern regions during the drift period was then considered, and the thesis advanced by the writer in 1873, that the decomposition of rocks "is an indispensable preliminary to glacial action and erosion, which removed previously softened materials," was discussed in its relation to boulders, glacial drift and the contours of glaciated regions. Pumpelly's development and extension of this doctrine of wind erosion, was noticed, and also the recent

<sup>1</sup> Abstract of paper by T. Sterry Hunt, LL.D., F.R.S., read before the National Academy of Sciences, at Washington, April 17, 1883.

comparative studies of Reusch in Norway and in Corsica, in which similar views are enforced.

The principal points in the paper are resumed at its close, as follows:

i. The evidence afforded by recent geological studies in America and elsewhere, of the universality and the antiquity of the subaërial decay both of crystalline silicated rocks and of calcareous rocks, and of its great extent in Pre-cambrian times.

ii. The fact that the materials resulting from such decay are preserved *in situ* in regions where they have been protected from denudation by overlying strata, alike of Cambrian and of more recent periods; or, in the absence of these, by the position of the decayed rock with reference to denuding agents, as in driftless regions, or in places sheltered from erosion, as within the St. Lawrence and Appalachian valleys.

iii. That this process of decay, though continuous through later geological ages, has, under ordinary conditions, been insignificant in amount since the glacial period, for the reason that the time which has since elapsed is small when compared with previous periods, and also probably on account of changed atmospheric conditions in the later time.

iv. That this process of decay has furnished the material not only for the clays, sands and iron-oxyds from the beginning of Palæozoic time to the present, but also for the corresponding rocks of Eozoic time, which have been formed from the older rocks by the more or less complete loss of protoxyd bases. The bases thus separated from crystalline silicated rocks have been the source, directly or indirectly, of all limestones and carbonated rocks, and have, moreover, caused profound secular changes in the composition of the ocean's waters. The decomposition of sulphuretted ores in the Eozoic rocks has given rise to oxydized iron ores *in situ*, and to rich copper deposits in various geological periods.

v. That the rounded masses of crystalline rocks left in the process of decay, constitute not only the boulders of the drift, but, judging from analogy, the similar masses in conglomerates of various ages, going back to Eozoic times, and that not only the forms of such detached mass, but the surface-outlines of eroded regions of crystalline rocks were determined by the preceding process of subaërial decay of these rocks.

GEOLOGY OF THE CHESTER VALLEY OF PENNSYLVANIA.—The following note from Mr. Chas. Hall further criticizes the article of Mr. Rand, which was the subject of a review by Professor Frazer in the May number of the NATURALIST:

I am unfortunately situated to make a reply to Mr. Rand's paper which appeared in the Proceedings of the Mineralogical and Geological Section of the Academy of Natural Sciences, inasmuch as I have none of my notes or even a copy of the paper

to which he refers. I can with propriety, however, make a few comments here on his argument.

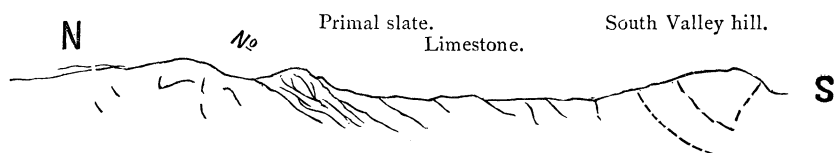
In the first place Mr. Rand does not account for the absence of slates, corresponding to the South Valley Hill belt (hydromica slate), on the north side of the Potsdam sandstone of the North Valley hill.

The Potsdam of the North Valley hill, in the vicinity of the Schuylkill river and the sandstone east of the river, rests directly upon a series of syenites, hornblendic and quartzitic rocks which correspond in age to the rocks of the Reading and Durham hills in Lehigh and Northampton counties (Laurentian).

Mr. Rand quotes a statement of mine that the "hydromica schists \* \* \* are the Hudson River shales and flank the Chester valley on the south."

The quotation does not convey the fact that I argued that the limestones of the Chester valley rested upon decomposed ferruginous slates with limonite ore and Potsdam sandstone.

The decomposed slates are without doubt the upper primal of Professor Rogers.



Along the southern margin of the limestone in the district under consideration (vicinity of the Schuylkill river) the limestones pass by gradual alternations into slates (hydromica slates of the South Valley hill).

The character of the limestone is very different along the south side of the valley from that on the north.

Along the northern side of the valley there is nothing to be seen of a transition from the the upper primal slates into the limestone of No. 11.

Adjoining the alternations of limestone and slate along the southern margin of the Chester valley *there is no regular deposit of sandstone or quartzite in any portion of the district where I have worked.*

The limestones along the northern edge of the Chester valley are usually more or less of a light drab color, and decidedly dolomitic, while on the southern side of the valley they are usually of a bluish cast and associated with white and blue marble. The marble is always confined to the southern side of the valley.

As a further argument in favor of the superposition of the hydromica schists of the South Valley hill, I considered the synclinal structure of the north-eastern point of the South Valley hill just north of Gulf mill and the synclinal structure of the Gulf Mill escarpment.

In the face of these and many other facts, I concluded that the South Valley Hill slates must belong to a more recent age than the limestones, and as there is a gradual transition from the limestones into these slates, similar to that found in other portions of the State, they must be of Hudson River age.

I have never observed any deposits of sandstone, of consequence, within the South Valley Hill belt, and none at all between the slates of the South Valley hill and the limestones.

Limonite ore does occur close to the junction of these slates and the limestone, at a point just north of Gulf mill and also south of the South Valley hill just west of West Conshohocken.

That deposit north of Gulf mill is intimately associated with the slates of the South Valley hill, but is very different from those in proximity to the Potsdam on the north side of the valley.

Without going further into details, I would say that Frazer's views and mine are at variance. He finds, I believe, rocks below (underlying) the Potsdam sandstone and interposed between it and the underlying syenitic rocks.

Our observations along the junction of the South Valley Hill slates and the limestones do not agree, and upon these two points depends the structure of the succeeding measures south of the valley.

Unfortunately Mr. Rand has apparently taken the tangled skein in hand and has begun in the middle to unravel a snarl which can only be accomplished by careful observation and comparison extending over a much larger area than a single township.—*Chas. E. Hall, Grove Hill, Page Co., Va.; April 3, '83.*

ANNUAL REPORT OF THE STATE GEOLOGIST OF NEW JERSEY FOR 1882.<sup>1</sup>—This little volume is brimful of information respecting the neighbor State, contains a complete geological map; two smaller maps, one illustrating the geodetic survey, the other the watersheds of the State; and six lithographs of prominent geological features. The topographical survey was engaged in 1882 upon 430 square miles of rugged highland, and in the Bearfort district three beautiful little lakes were mapped for the first time, and two others correctly located.

The red sandstone, or Triassic, occupies a broad belt crossing the State obliquely, and containing 1507 square miles. It is a plain shut in on the north and north-west by the Highlands, and open to the south and south-east toward the Cretaceous and newer deposits. This area contains, beside the sandstone proper and red shales, siliceous and calcareous conglomerates, limestones and trap rocks. As very nearly half the belt is north of the terminal moraine, these rocks are, to a great extent, concealed by glacial drift and alluvial beds deposited in basins formed by

<sup>1</sup> Annual Report of the State Geologist for the year 1882. Camden, N. J. F. F. Patterson.

glacial moraines. The shales vary in hardness from that of scarcely compacted clay to argillaceous sandstone, and some of the sandstone is argillaceous and liable to fall to pieces on exposure to atmospheric agencies.

The report gives valuable information respecting the iron mines, the output of which last year was 900,000 tons, or more than in any previous year; the plastic clays, with their industry of brick-making, terra-cotta and terra-cotta lumber (a mixture of sawdust and clay, forming a light yet strong building material); the changes of the shore line, the net result of which is considerably in favor of old ocean, who has encroached upon the meadow sod so that in some spots tracks of cattle and horses are found on what is now the beach; and upon seaside developments, climate, and the rapid progress of agriculture in the southern and almost sub-tropical extremity of the State.

THE TIDES ON THE BAY OF FUNDY.—Referring to the article in your paper of December 9, 1882, headed "Blomidon": These high tides, and the still higher stories we often hear of them, having perplexed me from youth, I set out last summer to study their reputed phenomena, before venturing to take a party of my friends in the steam yacht. The following course was sailed over: From this city to Halifax, N. S., standing well out to sea; thence coastwise to Cape Sable and Yarmouth; across the inner mouth of the bay to Grand Manan island; up the coast of New Brunswick to St. John and Truro, at the head of the bay; down the coast of Nova Scotia to Annapolis, which river and several others I ascended, thus circumnavigating the entire sheet of water, which is about 180 miles long by an average width of 40 miles. Soundings and deep sea and surface temperatures were taken during the cruise. A week was spent at Kingsfort, N. S., on the beautiful Basin of Minas, a few miles from Cape Blomidon and Cape Split.

These tides are, as you say, one of the wonders of the world. They are caused, as are also the dense fogs of this region and of the North Atlantic by the cold Gulf Stream,<sup>1</sup> pouring from the Arctic ocean by Smith sound, Baffin's bay and Davis strait, along the coast of Labrador, and through the Strait of Belleisle, which discharges into the Gulf of St. Lawrence. These cold, heavy currents hug the coast line as they run.

On doubling the south-east corner of Nova Scotia, at Cape Sable, they strike for the first time the warm and lighter waters from the south, and drive the latter before them toward the point of least resistance, which is up the Bay of Fundy. At its mouth, opposite Cape Sable, the tide rises 6 feet; opposite Digby, 28 feet; at St. John, 38 feet; off Windsor, 45 feet, and when ebb, a bucket could not be filled with water in the harbor; at Truro, 60 feet, and at ebb the red clay bottom is exposed for a distance of

<sup>1</sup> This is a mistake. Labrador current is undoubtedly meant.—*Eds.*

twenty-five miles. These measurements refer to spring tides, which are highest. But the belief which so generally prevails, that the tide assumes, as it rushes onward with loud roar and great velocity, a high, almost vertical wave, or "bore," as it is termed, which even draws into its vortex such animals as may stray near the beach, is wholly erroneous. *There is no bore or tidal wave on the Bay of Fundy.* Navigation there is neither dangerous nor difficult, unless it be from fog or ice. In the absence of storms, the tides, ebb and flood, are accompanied by scarcely a ripple. Even at Cape Split, where the bay suddenly contracts to a width of about three and a-half miles, the "wave" *will not measure one inch in height.* What can have been the origin of this fable, which has not only obtained general credence among many, but is even accepted by men of science without question, and is yet chimerical as a madman's dream? Probably the very trifling bore which does really exist on two small tributaries of the bay, the Petitcodiac and Shubenacadie. The bore on the former river I measured at Moncton, N. B., eighty-nine miles E.N.E. of St. John, and found it just three and a half feet high, with a travel up-stream of six miles per hour. It is caused by the last of the ebb tides being met and repelled by the flood tide in a narrow stream confined by almost vertical banks.—*P. F. McCourt, M. D., in Scientific American.*

A NEW IGUANODON.<sup>1</sup>—M. L. Dollo, of the Belgium Museum of Natural History, has carefully examined fifteen out of the twenty-two dinosaurs that have been found at Bernissart, and confirms the conclusion of M. G. A. Boulenger, who (*Sur l'arc pelvien chez les Dinosauriens*, Bull. de L'Acad. Roy. de Belg., 1881) recognized among them a new species of Iguanodon, to which he gave the name of *I. bernissartensis*. This new form is much larger than the well-known *I. mantelli*, the bones of which occur in company with it, as it attains a length of ten meters. It is also more massive in all its proportions, the fore limbs are longer compared with the hinder pair, the sacrum is formed of six vertebræ instead of five, and there are numerous other differences, too important to be individual or sexual in their nature. As in all the examples the cranial sutures are obliterated, it is certain that the larger form cannot be the adult of the smaller.

M. Dollo distinguishes three good species of Iguanodon, *I. prestwichii*, with four sacral vertebræ, *I. mantelli*, with five, and *I. bernissartensis*, with six. *I. seeleyi*, described by Professor Hulke in 1882, is thought to be identical with *I. bernissartensis*, but the question is not settled. The sternum in all the examples is well ossified.

GEOLOGICAL NEWS—*Post-tertiary*.—A deposit of mammalian remains of the diluvial period has been laid bare by the Wolga

<sup>1</sup> Sur les Dinosauriens de Bernissart. Par M. L. Dollo. Ext. du Bulletin du Musée Royal de Belgique. Tome 1, 1882.

on its banks, between Zarizyn and Sarepta. *Elephas primigenius*, *Bos priscus*, *Elasmotherium*, *Camelus knoblochi* and several antelopes, stags, etc., are among the contents.—Remains of animals, the bones of which have apparently been broken by man, together with many stone implements, have been found in the crevices between the blocks of lava underlying a pumicestone pit near Andernach, on the Rhine. As the pumicestone filled the crevices to a depth of two or three feet, and the bones, etc., were beneath this filling-in, it is believed that there was a settlement on the spot, the food-remains from which fell into the crevices *before* the deposition of the pumicestone.—On the Middle Ural M. Malakhoff has explored the lake dwellings of the neighborhood of Ekaterinburg, and has discovered close by Irbit, very interesting accumulations of bones, lake dwellings on Lake Ayat, and stone and bone implements in a cavern close to the Mias ironworks.

### MINERALOGY.<sup>1</sup>

NEW MINERALS.—I. *Jéréméïéwite* is a new mineral discovered by M. Jéréméïew in Southeastern Siberia, and named after him by Damour.<sup>2</sup> It occurs crystallized in regular hexagonal prisms, transparent and nearly colorless. Its hardness = 6.5; specific gravity 3.28. It has a vitreous fracture and is without cleavage. At first sight it resembles beryl, tourmaline or apatite.

Before the blowpipe it loses its transparency, blanches, and gives to the flame the green color characteristic of boric acid. It is with difficulty attacked by acids. With cobaltic nitrate, after heating, it takes a fine blue color.

It is essentially a borate of alumina with a small proportion of iron. A mean of three analyses gave :

B <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	
40.19	55.03	4.08	0.70	= 100.

yielding the formula (Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>) BO<sub>3</sub>.

II. *Picro-epidote* is a name proposed by Damour to designate a variety of epidote from Lake Baikal, Siberia, which has magnesia as a base and is infusible. It occurs in white or yellowish-white small crystals in lapis lazuli. Des Cloiseaux has shown that the crystallographic and optical characters are those of epidote.

III. *Dumreicherite* is a new mineral of the alum group described by Dr. C. Doelter<sup>3</sup> as occurring in crevices in lava in the form of superficial crusts. It was apparently monoclinic, but had a

<sup>1</sup> Edited by Professor H. CARVILL LEWIS, Academy of Natural Sciences, Philadelphia, to whom communications, papers for review, etc., should be sent.

<sup>2</sup> Bulletin Soc. Min. de France, T. VI, p. 20, April, 1883.

<sup>3</sup> Zur Kenntniss der vulcanischen Gest. u. Min. d. Capverd'schen Inseln.